

DETAILED ACTION

Priority

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been received and placed of record in the file of this national stage application from the International Bureau (PCT Rule 17.2 (a)).

Information Disclosure Statement

The information disclosure statement (IDS) submitted on 8/4/2006 was filed in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Steve Catlin on 2/17/2010.

Claims 4, 10, 12, and 13 of the present application have been amended as follows:

4. The photonic crystal having a heterostructure according to claim 1, which is characterized in that ~~the~~ each forbidden band zone consists of a two-dimensional photonic crystal having a slab-shaped body in which areas whose refractive index differs from that of the body are cyclically arranged.

10. The photonic crystal having a heterostructure according to claim 8, which is characterized in that ~~the~~ each forbidden band zone consists of a two-dimensional photonic crystal having a slab-shaped body, and a clad member is provided in contact with the branch waveguide.

12. The photonic crystal having a heterostructure according to claim 11, which is characterized in that ~~the~~ each forbidden band zone consists of a two-dimensional photonic crystal having a slab-shaped body provided with a cyclic arrangement of areas whose refractive index differs from that of the body, and a size and/or shape of the modified refractive index area or areas in proximity to the bend section differs from that of the other modified refractive index areas.

13. The photonic crystal having a heterostructure according to claim 8, which is characterized in that ~~the~~ each forbidden band zone consists of a two-dimensional photonic crystal having a slab-shaped body provided with a cyclic arrangement of areas whose refractive index differs from that of the body, and a size and/or shape of the modified refractive index area or areas in proximity to the connection point of the trunk waveguide and the branch waveguide differs from that of the other modified refractive index areas.

Allowable Subject Matter

Claims 1-15 are allowed.

The following is an examiner's statement of reasons for allowance:

The prior art does not disclose or reasonably suggest a photonic crystal having a heterostructure, which is characterized in that it comprises: (a) a first forbidden band

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zone and a second forbidden band zone, located adjacent to each other; (b) a trunk waveguide obliquely crossing a boundary between the two forbidden band zones, which is designed so that a multiplexed/demultiplexed wavelength band constituting a segment of a transmission wavelength band in the first forbidden band zone is excluded from a transmission wavelength band in the second forbidden band zone; and (c) a branch waveguide extending from an intersection of the trunk waveguide and the aforementioned boundary into the first forbidden band zone and being designed so that its transmission wavelength includes the aforementioned multiplexed/demultiplexed wavelength band.

While the prior art discusses the use of a photonic crystal structure to form switches, multiplexers, demultiplexers, etc, the prior art fails to disclose or reasonably suggest a structure as required by the claims. For example, Noda et al (US 7,224,862) discloses a photonic crystal multiplexer/demultiplexer using a boundary reflection, but does not disclose a trunk waveguide obliquely crossing the boundary or a branch waveguide as required by the claim. Similar statements pertain to Baumberg et al (US 6,888,994) which fail to show an oblique boundary and a trunk waveguide as recited.

At this time, it is also worthwhile to note Noda et al (US 7,428,352), while disclosing the above teachings, does not qualify as prior art, and further additionally claims a refractive index changing means not currently required or rendered obvious by the current invention.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably

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accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

The following prior art made of record and not relied upon is considered pertinent to applicant's disclosure: Noda et al (US 2005/0146778) discloses the use of a photonic crystal as a demultiplexer, wherein point defect resonators are used to filter a portion of an optical signal; and Kitagawa (US 2004/0165815) which uses a photonic crystal to separate wavelengths but fails to disclose a first and second forbidden band zone as required by the current invention.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rhonda S. Peace whose telephone number is (571)272-8580. The examiner can normally be reached on M-F (8-5).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Uyen-Chau Le can be reached on (571) 272- 2397. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Rhonda S. Peace/
Primary Examiner, Art Unit 2874
February 25, 2010